

### **REMARKS**

This Amendment is responsive to the final Office Action dated July 13, 2007. Applicant has amended claims 1, 4, 39, 40, and 75. Claims 1-82 are pending.

#### **Summary of Examiner Interview**

In a telephonic interview initiated by Applicant on October 3, 2007, Applicant's attorneys of record, Kent J. Sieffert and Jessica H. Kwak, and Examiner Bumgarner discussed the present application. The parties discussed the 35 U.S.C. § 112, first paragraph rejection presented in the final Office Action, as well as proposed claim amendments submitted by Applicant on September 13, 2007. In addition, the parties generally discussed the invention and the primary reference applied in the final Office Action, Chapoulaud et al. (U.S. Patent Application Publication No. 2002/0028417). No exhibits were introduced during the interview, and no agreement was reached with respect to the claims.

#### **Corresponding PCT Application**

As a preliminary comment, Applicant points out that independent claims 1, 39, and 75 have been to be substantially similar to the claims presented in the corresponding PCT application, PCT/US2004/041705, that was examined by the International Examining Authority (IEA). The International Preliminary Report on Patentability (IPRP) issued by the IEA concluded that claims 1-79 (the PCT application did not include claims 80-82) were novel and inventive over the cited prior art. The IPRP found that rendering a planar guide based on a position of the orthodontic appliance was novel. In addition, the IPRP found inventive step because:

The problem to be solved by the present invention may therefore be regarded as helping the practitioner to assess the best proper position of the appliance on the teeth. In document D1 [WO 01/47405A] the LAP is based on the tooth position and not on the appliance position. Document D2 [WO 99/16380] discloses that virtual "framing lines" on a real tooth image to guide a positioning tool holding a bracket. The inclusion of this features (sic) in the system of D1 would only result in the addition of a tool to put the brackets on the teeth. None of the cited documents disclose the claimed solution. The solution to this problem proposed in claim 39 of the present application is therefore considered as involving an inventive step.

Document D1 is a PCT application that corresponds to Chapoulaud et al., which was applied in the final Office Action for the present U.S. patent application. Documents D1 and D2 were cited in an Information Disclosure Statement and considered by Examiner Bumgarner on January 17, 2007.

### **Replacement Figures**

With the present Amendment, Applicant submits replacement drawing sheets for FIGS. 4-10 as originally filed. The replacement drawing sheets more clearly illustrate FIGS. 4-10, but are substantially identical in content to the originally-filed figures. No new matter has been added by way of the submission of replacement sheets for FIGS. 4-10.

### **Claim Rejection Under 35 U.S.C. § 112**

In the final Office Action, claims 1-82 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claims 3-11, 22, 24, 27, 28, 30, 38, 42-50, 58, 60, 63, 64, 74 and 76-78 were also rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

#### **35 U.S.C. § 112, first paragraph**

In support of the rejection of claims 1-82 under 35 U.S.C. § 112, first paragraph, the Office Action argued that:

The claim(s) contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not describe a method including the step of computing a location of a planar guide based on a placement of an orthodontic appliance. The original and still dependent claims show “displaying the planar guide” coming from stored (planar guide) data, not computation based on placement of an orthodontic appliance. The specification does not describe the guide control module being a computing device.<sup>1</sup>

As a preliminary comment, Applicant has entered a non-narrowing amendment to independent claims 1, 39, and 75 to remove the elements that recite computing a location of a planar guide

with the 3D environment based on a placement of an orthodontic appliance within the 3D environment relative to the dental arch. Consequently, the rejection under 35 U.S.C. § 112, first paragraph is rendered moot.

Moreover, Applicant respectfully disagrees with the Office Action. First, the guide control module is described in the specification and expressly shown in FIG. 2 as part of modeling software 20 executing on computing device 4.<sup>2</sup> Thus, the Examiner's assertion that the guide control module is not described as being a computer device is incorrect and contrary to the specification.

Second, Applicant respectfully disagrees with the conclusion that the specification does not describe a method that includes the step of computing a location of a planar guide based on a placement of an orthodontic appliance. The specification discusses at great length that the modeling software renders the planar guide(s) associated at positions within the 3D environment that are based on the location of the bracket with which the planar guide(s) are located. For example, at paragraph [0052], the disclosure states that, "[b]ased on this initial location [of a bracket], modeling software 20 locates the bracket within the 3D environment, **and renders one or more planar guides using a coordinate system associated with the bracket being placed.**" In addition, paragraph [0052] states, that "[i]n response to input from practitioner 8 adjusting the position or orientation of the bracket with respect to the tooth (60), **modeling software 20 automatically updates the positions and orientations of the bracket and any associated planar guides (62).**" Accordingly, as the bracket is moved, the location of the planar guide as rendered within the 3D environment is automatically adjusted. The specification and figures discuss these features at great length.

Applicant submits that one of ordinary skill in the relevant art would easily recognize that "generating" and "rendering" a planar guide at a location within a 3D environment based on a position of an associated appliance, as discussed throughout Applicant's disclosure<sup>3</sup>, would include computing the location of the planar guide within the 3D environment. In fact, if the location of the planar guide was merely stored without computation, as suggested by the

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<sup>1</sup> Office Action dated July 13, 2007 at page 2, item 2.

<sup>2</sup> Applicant's disclosure as originally filed at paragraphs [0026] and [0050].

<sup>3</sup> See, e.g., *id.* at paragraphs [0023] and [0052].

Examiner, the position of the planar guide within the 3D environment could never be automatically adjusted, which is directly counter to the specification.

Furthermore, the Examiner appears to be misconstruing the dependent claims. Applicant's dependent claims (e.g., dependent claim 18) do not state that the location of the planar guide is based on stored data. Rather, the dependent claims specify attributes of the planar guide are stored. As provided in the dependent claims, these attributes may include, for example, attributes that specify shear angles and scales for different types of planar guides or attributes that specify distances of different types of planar guides with respect to at least one tooth of a dental arch, a different planar guide or an orthodontic appliance.<sup>4</sup> A distance between a planar guide with respect to at least one tooth of a dental arch, a different planar guide or an orthodontic appliance is different than the location of the planar guide within the 3D environment.

As discussed above, in order to expedite prosecution of the application, Applicant has amended independent claims 1, 39, and 75. Claim 1 as amended states that "displaying the planar guide comprises rendering the planar guide at a location that is based on a position of the orthodontic appliance." Claim 39 as amended states that "the rendering engine renders the planar guide at a location based on a position of the orthodontic appliance." Claim 75 as amended recites a computer-readable medium comprising instructions that cause a programmable processor to display the planar guide by rendering the planar guide at a location based on a position of the orthodontic appliance within the 3D environment.

Support for the amendments to claims 1, 39, and 75 can be found throughout Applicant's originally-filed disclosure. For example, as discussed above, at paragraph [0052], the disclosure states that, "[b]ased on this initial location [of a bracket], modeling software 20 locates the bracket within the 3D environment, and renders one or more planar guides using a coordinate system associated with the bracket being placed." In addition, paragraph [0052] states, that "[i]n response to input from practitioner 8 adjusting the position or orientation of the bracket with respect to the tooth (60), modeling software 20 automatically updates the positions and orientations of the bracket and any associated planar guides (62)." Accordingly, as the bracket is moved, the location of the planar guide is also adjusted. Thus, it is clear that the disclosure supports the current claim amendment that displaying the planar guide comprises rendering the

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<sup>4</sup> See, e.g. claims 24 and 25.

planar guide at a location that is based on a position of the orthodontic appliance within the 3D environment.

Paragraph [0010] also provides support for the amendments to the independent claims, i.e., rendering the location of the planar guide within the 3D environment based on a position of an orthodontic appliance within the 3D environment. For example, paragraph [0010] describes different types of planar guides, and their relationship to an orthodontic appliance. For example, paragraph [0010] states that “an occlusal planar guide . . . is rendered parallel to the midlateral plane or slot of the bracket and proximate to the occlusal surface of the tooth.” This describes a direct relationship for the rendering of the planar guide within the 3D environment based on structure defined by the bracket.

Support for a “rendering” and a “rendering engine” that renders the planar guide, as recited in claim 39, is found throughout Applicant’s originally-filed disclosure. For example, at paragraph [0048], the disclosure states that, “[r]endering engine 26 accesses and renders 3D data 34 to generate the 3D view presented to practitioner 8 by user interface 22 . . . 3D data 34 includes information defining the 3D objects that represent each tooth, bracket, and planar guide within the 3D environment. Rendering engine 26 processes each object to render a 3D triangular mesh based on viewing perspective of practitioner 8 within the 3D environment.”<sup>5</sup>

Reference to a “location” of a planar guide within a 3D environment is also made throughout Applicant’s originally-filed disclosure. For example, paragraph [0023] also states that, “the modeling software automatically adjusts the 3D location and orientation of the planar guides as the practitioner adjusts the bracket with respect to the tooth.”

Similarly, support for a “position” of an orthodontic appliance within a 3D environment is found through-out Applicant’s originally-filed disclosure. For example, at paragraph [0007], the disclosure states that “[b]y interacting with the system, orthodontic practitioners are able to visualize the 3D representation of the dental arch, and precisely position ‘virtual’ orthodontic appliances relative to the modeled dental arch.” As another example, at paragraph [0039], reference is made to “bracket positions.”

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<sup>5</sup> Emphasis added.

Applicant submits that claims as previously presented and as currently amended comply with 35 U.S.C. § 112, first paragraph. Reconsideration and withdrawal of the rejection is respectfully requested.

**35 U.S.C. § 112, second paragraph**

With respect to the rejection of claims 3-11, 22, 24, 27, 28, 30, 38, 42-50, 58, 60, 63, 64, 74 and 76-78 under 35 U.S.C. § 112, second paragraph, the Office Action found that, “[i]t is not clear to what is a midsagittal plane, a midlateral plane, a midfrontal plane, occlusal-gingival axis of the *orthodontic appliance* and coordinate system associated with the orthodontic appliance, i.e., there is no structure given to the orthodontic appliance to identify the planes and axis.”<sup>6</sup> Applicant respectfully maintains that the claims as originally presented are definite and meet the requirements of 35 U.S.C. § 112, second paragraph.

Claim 3 recites a method of rendering a planar guide within a 3D environment using a coordinate system associated with the orthodontic appliance. Regardless of the actual structure of the orthodontic appliance, Applicant’s claim 3 clarifies that there is a coordinate system associated with the orthodontic appliance, and that a method includes rendering a planar guide using that coordinate system. In an example provided in Applicant’s disclosure, modeling software “renders one or more planar guides using a coordinate system associated with the bracket being placed.” The orthodontic appliance does not require specific structure in order for there to be a coordinate system associated with the appliance. Accordingly, claim 3 particularly points out and distinctly claims a method of rendering the planar guide using the coordinate system of the orthodontic appliance.

Claim 42 recites a system including a guide control module that generates the planar guide within the 3D environment based on a coordinate system associated with the orthodontic appliance. Just as with claim 3, the orthodontic appliance need not be required to have specific structure, simply that there is a coordinate system associated with the particular appliance. Accordingly, the guide control module may generate a planar guide based on a coordinate a system associated with an orthodontic appliance, regardless of the type of orthodontic appliance or the structure of the orthodontic appliance.

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<sup>6</sup> Office Action dated July 13, 2007 at page 2, item 4 (emphasis in original).

Claim 76 recites a computer-readable medium that comprises instructions that cause a programmable processor to associate a coordinate system with the orthodontic appliance within the 3D environment, and generate the planar guide within the 3D environment relative to the coordinate system associated with the orthodontic appliance. Thus, according to claim 76, a coordinate system may be associated with the orthodontic appliance, regardless of the actual structure of the orthodontic appliance.

Claims 22, 24, 58, and 60 as originally presented also meets the limitations of 35 U.S.C. § 112, second paragraph. Claims 22, 24, 58, and 60 do not recite a plane of an orthodontic appliance or an axis of an orthodontic appliance. Accordingly, the basis for the 35 U.S.C. § 112, second paragraph rejection is unclear. Notwithstanding the clarity of the rejection of claims 22 and 24, Applicant notes that claims 22, 24, 58, and 60 are definite. Claim 22 recites a method that includes storing attributes for different types of planar guides with respect to different types of orthodontic appliances. Regardless of the types of orthodontic appliances, claim 22 requires storing attributes for the different types of orthodontic appliances. Similarly, claim 58 is directed to a database that stores attributes for different types of planar guides with respect to different types of orthodontic appliances. The structure of the orthodontic appliance is irrelevant to whether the scope of claims 22 and 58 “is clear to a hypothetical person possessing the ordinary level of skill in the pertinent art,” which is a standard for meeting the requirements of 35 U.S.C. § 112, second paragraph.<sup>7</sup>

Claim 24 recites storing attributes that specify distances for each of the different types of planar guides with respect to at least one of a tooth of the dental arch, a different one of the planar guides, and the orthodontic appliance. Claim 60 is directed to a system including a database that stores attributes that specify distances for each of the different types of planar guides with respect to at least one of a tooth of the dental arch, a different one of the planar guides, and the orthodontic appliance. The scope of the claim term “attributes” for different types of planar guides is clear and does not require the recitation of a structure of an orthodontic appliance to provide definiteness to the claim. One skilled in the art would understand the scope of claims 24 and 60, even without the recitation of a type of orthodontic appliance or a particular orthodontic appliance structure.

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<sup>7</sup> MPEP 2171.

Claims 38 and 74 clarify that the orthodontic appliance comprises an orthodontic bracket, a buccal tube, a sheath, a button or an arch wire. The basis for the 35 U.S.C. § 112, second paragraph rejection is unclear because neither claim 38 nor claim 74 recite a plane of an orthodontic appliance or an axis of an orthodontic appliance. An orthodontic bracket, a buccal tube, a sheath, a button, and an arch wire are well-known terms in the art, and, thus, the scope of claims 38 and 74 “is clear to a hypothetical person possessing the ordinary level of skill in the pertinent art” and claims 38 and 74 meet the requirements of 35 U.S.C. § 112, second paragraph.<sup>8</sup> Applicant respectfully requests withdrawal or clarification of the rejection of claims 38 and 74 under 35 U.S.C. § 112, second paragraph.

Claim 4 specifies that a method includes adjusting the location and an orientation of the planar guide within the 3D environment as the practitioner adjusts the placement of the orthodontic appliance with respect to the tooth within the 3D environment. Again, the basis for the 35 U.S.C. § 112, second paragraph rejection is unclear because, contrary to the argument presented in the Office Action, claim 4 does not recite a plane of an orthodontic appliance or an axis of an orthodontic appliance. Further, Applicant notes that claim 4 is definite. As claim 1 specifies, the location of the planar guide within the 3D environment is based on a position of the orthodontic appliance within the 3D environment. Claim 4 further specifies that as the practitioner adjusts the position orthodontic appliance within the 3D environment, the location and orientation of the planar guide is automatically adjusted.<sup>9</sup> In this way, the location of the planar guide is automatically updated “based on” the position of the orthodontic appliance within the 3D environment. As a result of this relationship between the planar guides and the position of the orthodontic appliance, the planar guides provide a good visual indication of the position of the bracket relative to the tooth on which the bracket is being placed. For at least these reasons, claims 43 and 77 are also definite.

Claims 5-11, 30, 44-50, 64, and 78 each recite at least one of a midsagittal plane, midlateral plane or a midfrontal plane of an orthodontic appliance. In addition, claims 28, 30, 64, and 66 recite a longitudinal or occlusal-gingival axis of an orthodontic appliance. These

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<sup>8</sup> *Id.*

<sup>9</sup> *See, e.g.,* Applicant’s disclosure at paragraphs [0008] and [0043].



recited claims terms have well-known meaning in the art and are used consistent with their ordinary meanings throughout Applicant's originally-filed disclosure.

For example, a "midsagittal plane" is well-known to be a plane that divides an object into right and left halves.<sup>10</sup> "Midsagittal plane" is used in a consistent manner with the well-known definition throughout Applicant's originally-filed disclosure. For example, the disclosure states that, "a midsagittal planar guide may be rendered parallel to a midsagittal plane of the bracket."<sup>11</sup> A bracket is a type of orthodontic appliance.<sup>12</sup> As FIG. 10 (copied below) illustrates, midsagittal plane of the bracket, which is parallel to the midsagittal planar guide 98, is a plane that divides the bracket into left and right halves.

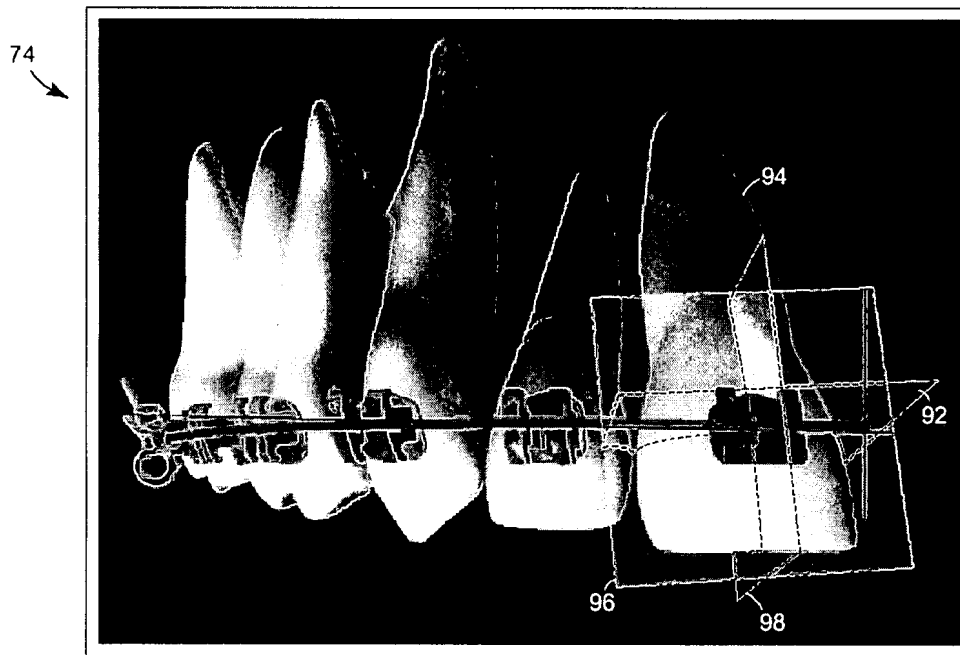


FIG. 10

Applicant's disclosure also states that a mesial planar guide and a distal planar guide are rendered parallel to the midsagittal plane of the bracket being placed.<sup>13</sup> A distal planar guide 84 and mesial planar guide 86 are shown in FIG. 5 (copied below). Because the distal planar guide

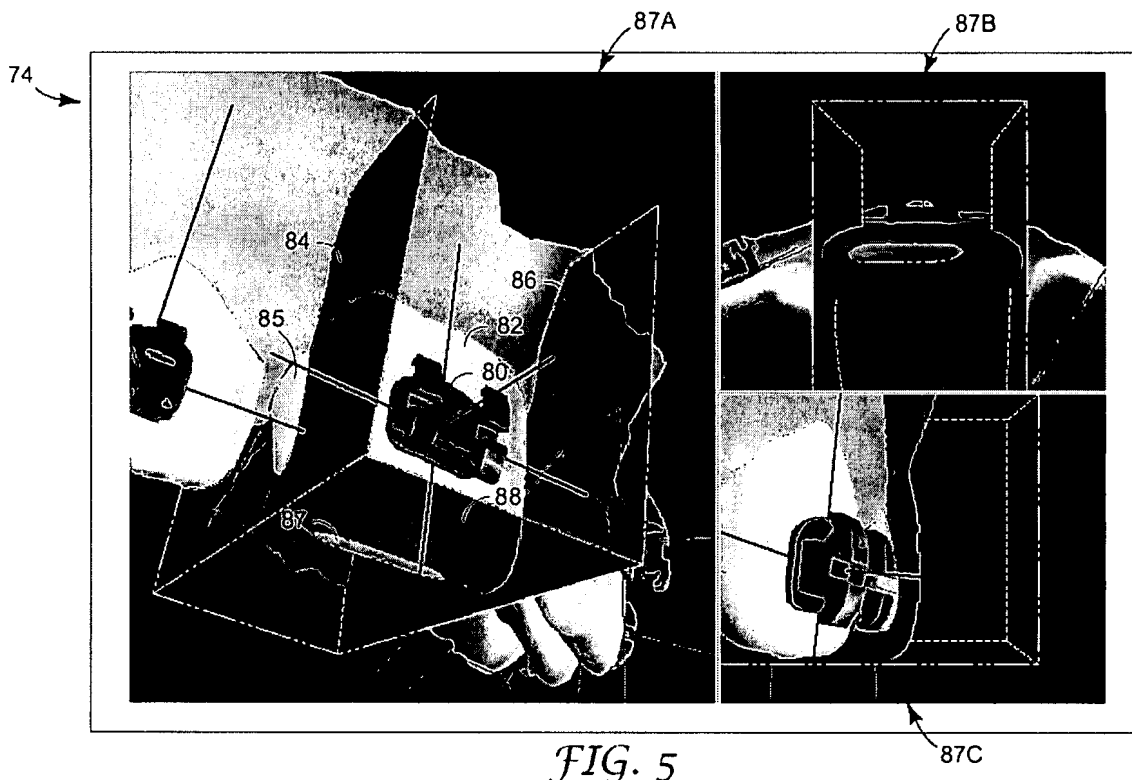
<sup>10</sup> See, e.g., [http://www.biology-online.org/dictionary/Midsagittal\\_plane](http://www.biology-online.org/dictionary/Midsagittal_plane) and [http://en.wikipedia.org/wiki/Sagittal\\_plane](http://en.wikipedia.org/wiki/Sagittal_plane).

<sup>11</sup> Applicant's originally-filed disclosure at paragraph [0012].

<sup>12</sup> See, e.g., *id.* at paragraph [0050].

<sup>13</sup> *Id.* at paragraph [0010].

84 and mesial planar guide 86 are rendered parallel to the midsagittal plane of the bracket 80<sup>14</sup>, the midsagittal plane of the bracket 80 must necessarily extend in the same direction as the distal planar guide 84 and mesial planar guide 86, i.e., substantially along a direction that bisects the bracket 80 into left and right halves, as is the ordinary meaning of “sagittal.” Regardless of the structure of the orthodontic appliance, a midsagittal plane of the orthodontic appliance remains the same, i.e., a plane that divides the orthodontic appliance into right and left halves. For at least these reasons, the claim term, “midsagittal” is clear, even if the structure of the orthodontic appliance is not explicitly recited in claims 5, 6, 10, 30, 44, 45, 49, 66, and 78.



The ordinary and well-known meaning of “lateral” is being situated at, proceeding from, or directed to a side.<sup>15</sup> Thus, a “midlateral plane” is frequently used to describe a plane that bisects the middle of an object in a sideways direction. “Midlateral plane” is used in a consistent manner with the well-known definition throughout Applicant’s originally-filed disclosure. For example, the disclosure states that, “a midlateral planar guide . . . is rendered parallel to the

<sup>14</sup> *Id.*

<sup>15</sup> See, e.g., <http://dictionary.reference.com/browse/lateral>.

midlateral plane of the bracket being placed.”<sup>16</sup> FIG. 10 illustrates a midlateral planar guide 92 that is “rendered within the midlateral plane of tooth 94.” The midlateral planar guide 92 is shown as extending from one side of the tooth 94 to the other. Accordingly, the midlateral plane of the bracket, which is parallel to the midlateral planar guide 92<sup>17</sup>, also extends in the same direction as the midlateral planar guide 92.

Applicant’s disclosure also states that “an occlusal planar guide . . . is rendered parallel to the midlateral plane . . . of the bracket.”<sup>18</sup> FIG. 5 illustrates an occlusal planar guide 88, which also extends from one side of a tooth to another. Thus, the midlateral plane of the bracket must also extend from one side of a tooth to another. For at least these reasons, the claim term, “midlateral” is clear, even if the structure of the orthodontic appliance is not explicitly recited in claims 7, 8, 11, 46, 47, 50, and 78.

The ordinary and well-known meaning of frontal” is at the front, in the front or front of an object.<sup>19</sup> Thus, a “midfrontal plane” is a plane that extends midway between the front and back of an object. “Midfrontal plane” is used in a consistent manner with the well-known definition throughout Applicant’s originally-filed disclosure. For example, the disclosure states that, “a midfrontal planar guide may be rendered parallel to the midfrontal plane of the bracket.”<sup>20</sup> In addition, FIG. 10 illustrates a “midfrontal planar guide 96 rendered substantially parallel to a midfrontal plane of tooth 94.”<sup>21</sup> As FIG. 10 illustrates, the midfrontal planar guide 96 extends parallel to a front of the bracket, which is also parallel to the midfrontal plane of the tooth 94. For at least these reasons, the claim term, “midfrontal plane” is clear, even if the structure of the orthodontic appliance is not explicitly recited in claims 9, 48, and 78.

An “occlusal-gingival axis” of an appliance has an ordinary and well-known meaning. For example, in U.S. Patent No. 7,188,421 to Cleary et al., reference is made to an occlusal-gingival axis of the appliance 34.<sup>22</sup> As is well-known in the art, the occlusal-gingival axis of an orthodontic appliance extends in a direction substantially along the occlusal surface of a tooth to which the appliance is coupled to the gingival. Accordingly, regardless of the structure of the

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<sup>16</sup> Applicant’s originally-filed disclosure at paragraph [0033].

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> See, e.g., <http://dictionary.reference.com/browse/frontal>.

<sup>20</sup> Applicant’s originally-filed disclosure at paragraph [0012].

<sup>21</sup> *Id.* at paragraph [0062].

orthodontic appliance, the appliance may include an axis that extends in the occlusal-lingual direction.

Applicant's disclosure also states that a "longitudinal axis" of an orthodontic appliance, such as a bracket, is parallel to the midsagittal plane of the appliance.<sup>23</sup> As described above, a "midsagittal plane" of an orthodontic appliance is a definite term, and does not require the recitation of structure to provide definiteness to the term, "midsagittal plane." As a result, a "longitudinal plane," which is parallel to the midsagittal plane is also a clear term. For at least these reasons, the claim term, "occlusal-lingual axis" and "longitudinal axis" is clear, even if the structure of the orthodontic appliance is not explicitly recited in claims 28, 30, 64, and 66.

Claims 27 and 63 recite an angulation associated with an orthodontic appliance. It is well-known in the art that an orthodontic appliance, such as a bracket, may include an angulation. For example, in U.S. Patent No. 7,264,468 to Kesling et al., reference is made to a bracket that "can take the shape associated with the predetermined tip angulation."<sup>24</sup> As another example, U.S. Patent No. 7,234,934 to Rosenberg states that, "[o]ne-piece orthodontic brackets are cast or molded to exert a fixed ('average') amount of up-down, in-out, side-to-side, angulation, rotation, or torque force."<sup>25</sup> Thus, the reference to an "angulation associated with the orthodontic appliance" in claims 27 and 63 is definite.

For at least these reasons, Applicant requests immediate withdrawal of all rejections under 35 U.S.C. § 112, second paragraph.

#### **Claim Rejection Under 35 U.S.C. §§ 102(b) and 103(a)**

In the final Office Action, claims 1-13, 18, 19, 27, 28, 31-35, 37-55, 67-71, 73-78, and 80-82 were rejected under 35 U.S.C. § 102(b) as being anticipated by Chapoulaud et al. In addition, claims 14-17, 20-26, 36, 56-64, and 72 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chapoulaud et al., and claims 29, 30, 65, 66, and 79 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chapoulaud et al. in view of Kopelman et al. (U.S. Patent Application Publication No. 2003/014509). Applicant respectfully traverses the rejection

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<sup>22</sup> U.S. Patent No. 7, 188,421 at col. 10, ll. 31-34.

<sup>23</sup> Applicant's originally-filed disclosure at paragraph [0045].

<sup>24</sup> U.S. Patent No. 7,264,468 at col. 5, ll. 15-20.

<sup>25</sup> U.S. Patent No. 7,234,934 at col. 2, l. 66 – col. 3, l. 2.

of the claims. The cited references fail to disclose or suggest each and every feature of the claimed invention, as required by 35 U.S.C. §§ 102(b) and 103(a), and provide no teaching that would have suggested the desirability of modification to include such features.

For example, Chapoulaud et al. fails to disclose a method that includes displaying a planar guide within a 3D environment as a visual aid to a practitioner in the placement of the orthodontic appliance relative to the dental arch, wherein displaying the planar guide comprises rendering the planar guide at a location that is based on a position of the orthodontic appliance within the 3D environment, as recited by claim 1.

In support of the rejection of the claims, the Office Action stated that Chapoulaud et al. teaches a planar guide and relied on FIG. 4 of Chapoulaud et al. as showing a planar guide.<sup>26</sup> However, as a preliminary comment, FIG. 4 merely illustrates a positioning grid represented by a plurality of lines, rather than a planar guide.<sup>27</sup> Chapoulaud et al. is concerned with the grid lines themselves, and does not contemplate a planar guide. For example, Chapoulaud et al. states that, “the grid lines intersect the boundaries of the mandibular trough. These boundaries B<sub>B</sub> and B<sub>L</sub> can be selected by pattern recognition software, manually by the operator 28 clicking with a pointing device at the grid and boundary intersection points . . .”<sup>28</sup>

Furthermore, even if the positioning grid was a planar guide, a point with which Applicant respectfully disagrees, Chapoulaud et al. does not teach rendering the planar guide at a location that is based on a position of the orthodontic appliance within the 3D environment, as recited by claim 1 as amended. Chapoulaud et al. completely lacks any disclosure that states that the location of its grid is based on a placement of an orthodontic appliance with the 3D environment relative to a dental arch. Quite the contrary, Chapoulaud et al. teaches that the grid is initially placed relative to the digital bitmap of a dental arch itself.<sup>29</sup> The location of the grid can then be adjusted by an operator, such as by clicking on the grid and manually moving points of the grid.<sup>30</sup> Chapoulaud et al. does not, however, disclose any relationship between the location of the planar guide within the 3D environment and a position of the orthodontic appliance. In contrast, claim 1 positively requires the location of the planar guide to be based on a position of

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<sup>26</sup> Office Action dated July 13, 2007 at page 3, item 6.

<sup>27</sup> Chapoulaud et al. at paragraph [0076].

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

the orthodontic appliance within the 3D environment. Indeed, the Chapoulaud et al. grid appears to be independently movable without any regard to the placement of an orthodontic appliance, or even the placement of the dental arch.

Consequently, Chapoulaud et al. does not teach displaying the planar guide as a visual aid to a practitioner in adjusting the placement of the orthodontic appliance relative to the dental arch, as required by claim 1 as amended. While Chapoulaud et al. discusses adjusting the torque, tip and rotation of brackets<sup>31</sup>, this has no affect on the position or orientation of the grid. Chapoulaud et al. does not teach or even suggest using the positioning grid as a visual aid to the practitioner in adjusting the placement of the bracket. Chapoulaud et al. only teaches and suggests using the positioning grid to define the boundaries of each tooth image relative to other teeth so that individual tooth images can be manipulated. Furthermore, Chapoulaud et al. only teaches use of the positioning grid during the phase in which the boundaries of each tooth image are determined, and the positioning grid is not even displayed when an orthodontic appliance is displayed.<sup>32</sup>

Applicant's independent claim 39 as amended recites a system comprising a user interface that displays a planar guide within a 3D environment as a visual aid to a practitioner in the placement of an orthodontic appliance relative to the dental arch within the 3D environment, where the rendering engine renders the planar guide at a location based on a position of the orthodontic appliance. Applicant's independent claim 75 as amended recites a computer-readable medium comprising instructions for causing a programmable processor to compute a location of a planar guide based on a placement of an orthodontic appliance within a 3D environment relative to a dental arch, and display the planar guide within the 3D environment as a visual aid to a practitioner in adjusting the placement of an orthodontic appliance relative to the tooth. For similar reasons discussed above with respect to claim 1, Chapoulaud et al. also fails to teach or suggest each and every element of independent claims 39 and 75.

With the present Amendment, Applicant has amended claim 4 to be in independent form. Claim 4 recites a method that includes, among other things, positioning an orthodontic appliance at a position within the 3D environment in response to input from a practitioner and displaying

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<sup>30</sup> *Id.*

<sup>31</sup> *Id.* at paragraph [0091].

<sup>32</sup> *See id.* at FIG. 5E.

the planar guide within the 3D environment, where displaying the planar guide comprises rendering the planar guide at a location within the 3D environment that is based on the position of the orthodontic appliance; and automatically adjusting the location and an orientation of the planar guide within the 3D environment as the practitioner adjusts the placement of the orthodontic appliance with respect to the tooth within the 3D environment.

As described above with respect to claim 1, support for “rendering the planar guide at a location within the 3D environment that is based on the position of the orthodontic appliance” may be found throughout Applicant’s disclosure, such as at paragraphs [0010], [0048], and [0052]. In addition, support for “positioning an orthodontic appliance at a position within the 3D environment in response to input from a practitioner” may be found throughout Applicant’s disclosure, such as paragraph [0052], which states, “[i]n response to input from practitioner 8 adjusting the position or orientation of the bracket with respect to the tooth (60), modeling software 20 automatically updates the positions and orientations of the bracket and any associated planar guides (62).” Paragraph [0051] also states that, “[t]o position a bracket within the 3D environment, modeling software 20 first receives input from practitioner 8 . . . practitioner 8 interacts with modeling software 20 to select an initial bracket location.”

Chapoulaud et al. also fails to disclose or suggest each and every element of independent claim 4. According to claim 4, as the practitioner adjusts the placement of the orthodontic appliance within the 3D environment, the location and orientation of the planar guide are automatically adjusted because the location of the planar guide is based on the position of the orthodontic appliance. As discussed above with respect to claim 1, the positioning grid in Chapoulaud et al. may be moved independently of, i.e., without relation to, any orthodontic appliances or teeth. Thus, the location of the Chapoulaud et al. grid cannot be based on the position of the orthodontic appliance. Chapoulaud et al. does not contemplate any relationship between the position of the positioning grid and the location of an orthodontic appliance. Accordingly, Chapoulaud et al. does not teach or suggest a method in which a planar guide is automatically adjusted as the practitioner adjusts the placement of an orthodontic appliance, as recited by claim 4.

All claims depending from independent claims 1, 39, and 75 are also patentable over Chapoulaud et al. However, Applicant also notes that dependent claims 2-38, 40-74, and 76-82

are also distinguishable over Chapoulaud et al. For example, claims 5-11, 44-50, and claim 78 specify different types of planar guides, such as mesial planar guides, occlusal planar guides, midlateral planar guides, midfrontal planar guides, and midsagittal planar guides. Chapoulaud et al. does not teach planar guides, much less different types of planar guides. The types of planar guides recited in claims 5-11, 44-50, and claim 78 each have a specific relationship to an orthodontic appliance. For example, the mesial planar guide recited in claim 5 is rendered parallel to a midsagittal plane of an orthodontic appliance. Chapoulaud et al. does not disclose or suggest that the positioning grid may be rendered parallel to particular plane, e.g., the midsagittal plane, of an orthodontic appliance.

Kopelman et al. fails to overcome the basic deficiencies in Chapoulaud et al. identified above. For at least these reasons, the Examiner has failed to establish a prima facie case of nonpatentability of Applicant's claims 1-82 under 35 U.S.C. §§ 102(a) and 103(a). Reconsideration and withdrawal of these rejections is respectfully requested.

### CONCLUSION

All claims in this application are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of all pending claims. Please charge any additional fees or credit any overpayment to deposit account number 50-1778. The Examiner is invited to telephone the below-signed attorney to discuss this application.

Date:

By:

October 15, 2007

SHUMAKER & SIEFFERT, P.A.  
1625 Radio Drive, Suite 300  
Woodbury, Minnesota 55125  
Telephone: 651.735.1100  
Facsimile: 651.735.1102

Kent J. Sieffert

Name: Kent J. Sieffert  
Reg. No.: 41,312